

SECRET

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PAR 211

29 Feb 64

SUBJECT: Microdensitometer Study of Effects of Processing

TASK/PROBLEM

Collect and study microdensitometric data from mission materials in an attempt to determine the effect of film emulsions, processing and printing on the characteristics of image edges. An attempt will also be made to determine true location of image edges for mensuration purposes.

DISCUSSION

A work program has been prepared to initiate this investigation. The modulation transfer camera is being tested to see whether in-house MTF exposures can be used along with acutance, resolution and granularity measurements to evaluate processing effects. A short literature search has been conducted.

PLANNED ACTIVITY

During the next quarter, additional equipment will be selected and methods established for making the following Image Structure measurements: (1) Acutance, (2) Modulation Transfer, (3) Resolving Power and (4) Granularity. Aerial films of greatest interest and their complimentary duplication stock will be evaluated for the special processing and printing conditions used in mission photography.

A study will be started to determine the effect of developer composition on edge sharpness and granularity.

Declass Review by NGA.

STUDY PROGRAM OBJECTIVE

Microdensitometer Study of the Effects of Processing on Edges

(PAR-211)

Problem

In order to properly evaluate the microdensitometric data obtained from mission material, it would be desirable to know the mutual effects emulsion type, printing and processing on the characteristics of image edges.

There is also the question of where the "true" edge lies when mensuration is involved. Mutual effects are also important here.

Proposal

The proposed means for attacking these problems are outlined below:

1. Edge Characteristics

Tests will be made to objectively measure the edge characteristics of the following typical combinations of film, printers, and processes:

<u>Taking</u> <u>Film</u>	<u>Process</u>	<u>Duplicate</u> <u>Film</u>	<u>Process</u>	<u>Printer</u>
4404	Trenton All Conditions	8430	Dalton	Niagara
4400	Trenton All Conditions	8430	Dalton	Niagara
4401	Trenton All Conditions	5427	Dalton	Niagara

Other combinations will be measured as requested by the customer. The results will be tabulated in a report with a description of the test methods used to determine the characteristics.

2. Developer Composition

Developer composition is known to produce changes in the relative acutance-granularity characteristics of films. Typically, a developer which optimizes acutance (subjectively, sharpness) does so at the expense of granularity (subjectively, graininess), and vice versa. Many developers in use today are a compromise between these extremes.

The purpose of this study is to determine if this compromise optimizes the information content of high definition aerial photographs or if changes would further enhance the quality. The results of this study will serve as a guide for future development of film-developer systems.

- (a) Using a published developer formula with a fine grain aerial film, the composition will be varied to obtain three processes; one having high sharpness, one having low graininess, and one representing a compromise between the other two. Using the microdensitometer and other test equipment, objective measurements of the image characteristics will be determined.
- (b) Practical aerial exposures at two scales will be processed through each developer composition and these tests will be subjectively evaluated by a number of trained photo interpreters to determine statistical preferences.
- (c) The relationship between objective measurements and subjective evaluation will be analyzed and the results used as a guide for future improvements in films developer systems.

3. Mensuration Prints

- (a) A survey will be made of the equipment, sensitized materials and processes now in use by the customer for producing mensuration prints. Information concerning the limitations and deficiencies of the present system will be sought, together with know requirements and desired improvements for a new system.
- (b) Based on the information obtained in (a), a definite test plan will be established to study possible means of improving existing techniques.

Close liaison with the customer will be maintained throughout this study, and his facilities may be required for some testing.